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Claremont McKenna College

The Effects of Positive and Negative Environmental Responsibility on
Financial Performance

Submitted to
Professor Matthew Magilke

By
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for
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Abstract

As environmental responsibility (ER) gains momentum in the corporate and stakeholder world, it is imperative to understand the relationship between ER and financial performance. While there is prior research looking at this relationship, this study provides further insight into the specific effects of negative and positive ER. In addition, it looks over the years 2008-2011 having implications for companies about the effects of their ER even through financial hardships. This study uses a widely respected corporate social responsibility database, in which ER scores were separated from. In this study, 287 firms in the S&P 500 are examined through times-series regression analyses. The results reveal that positive ER had a negative relationship with financial performance indicators Tobin's q and ROA. However, negative ER had such strong positive relationship with financial performance in both measures, that when looking at the effect of net ER, the relationship was tipped back to positive. This indicates that negative ER worsens a company's financial position more than spending on positive ER initiatives.

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CHAPTER 1: INTRODUCTION

In this paper, I explore the relationship between environmental responsibility (ER) and financial performance.¹ I look at the different effects of total ER on the financial measures: return on assets and Tobin's q, then specifically look into the different effects of positive versus negative ER with financial performance. The performance of the financial measures has indications for stakeholder activities, such as investors who engage in socially, responsible, impact (SRI) investing. Despite a growing number of investors engaging in SRI investing, whether or not this strategy is financially superior has remained a fierce debate between investors, academia, and other business professionals. Providing further insight into the key arguments of this debate, I will take a closer look at how the markets and profitability of a firm reacts to the effects of positive and negative ER.

Overall, I found a strong positive relationship with negative ER scores, meaning that the worse a company performed regarding ER, the worse a company performed financially. After I looked at the specific effects of positive versus negative ER, I found positive scores had had a negative effect on financial performance while an increase in the negative ER score resulted in a positive effect on financial performance. The effect of the negative ER relationship was that much more significant relative to the positive ER scores,

¹ Throughout this paper, environmental responsibility, environmental performance, and environmental ratings will be used to describe the environmental variable. Both environmental performance and environmental ratings are used as indicators of overall environmental responsibility. Environmental responsibility represents a company's overall impact on the environment through both strengths and weaknesses of practices.

that it tipped the relationship of net ER and financial performance back to a net positive relationship.

Prior analyses study environmental disclosure and performance and its relationship with financial performance to seek a better understanding and find evidence regarding a possible positive relationship. Generally, there has been more literature suggesting that there is a positive relationship, especially in the long-run. However, there is minimal research into the specific effects and comparisons of net, and positive versus negative ER. This paper provides further insight into the positive and negative environmental responsibility-financial performance relationship, and contribute to an increasing literature base on this relationship. This study will have implications for corporate officers managing a company's ER initiatives and reputation and generally what practices they should be implementing and promoting.

1.1 Background

The world has seen numerous environmental disasters which have been paired with the growing awareness of the impact that positive environmental changes can have on the Earth. In the past couple of decades, this concern has been addressed at both the public and corporate levels. More and more of the investing and consuming public, as well as corporations are increasing their consideration of environmental responsibility as a basis in making decisions on what to buy and how to act in their respective positions. In addition, all local, federal, and international governments have recognized this shift in environmental concern and awareness and have responded with regulations and policies, such as caps on

carbon emissions. Companies are now increasing efforts to be more transparent in their environmental responsibilities through both voluntary and mandatory reporting.

1.1.1 Political Environmental Responsibility Efforts

In the 1990s, the United Nations met and established the United Nations Framework Convention on Climate Change (UNFCCC). This marked the first worldwide initiative to address and mitigate climate change. At these conventions, country representatives from all over the world came together to rally international support and cooperation to combat climate change through planning and proposing global plans that reduce emissions. These conventions followed decades of manmade environmental-catastrophic events such as the Chernobyl nuclear explosion in 1986,² and the Love Canal disaster in the 1940s and early 50s.³ Two years after the first UNFCCC convention, world representatives drafted and adopted the Kyoto Protocol that committed the ratifying countries to reducing their greenhouse gas emissions, and developing steps toward using renewable energy sources to avoid carbon emissions and toxic output. The Kyoto Protocol had undergone numerous adaptations and additions that furthered emissions targets to even

² The Chernobyl explosion is considered one of the worst environmental disasters in the world. According to a report done on the Chernobyl disaster in 2009 by the Belarus Foreign Ministry, an estimated amount of \$18.8 billion has been spent on restoring the damage done by the explosion, which is only 8% of the total \$235 billion estimated to fully restore the damage. This does not include environmental and health damage to the surrounding areas. Friends of Chernobyl Centers estimated the radiation affecting 63,000 square miles of the surrounding land and total people affected at 7 million.

³ The Love Canal disaster was one of the worst American environmental disasters. In an article by the New York Times after the Love Canal was officially considered cleaned up, it was reported that a total of \$400 million was spent to clean up 16-acres. After 21,000 tons of hazardous waste had been dumped and covered up, the land was sold to the school board, which was then sold after a school had been built, to construct a suburban area surrounding the school. After record rains, chemicals intoxicated homes and surround land resulting in burns, birth defects, and miscarriages.

lower than initially set amounts, and updated a country's commitment to reducing their emissions.⁴ One significant limitation of the Kyoto Protocol, however, was that it mainly focused on developed nations and those able to cut their emissions without financial help. This left out developing countries at the time, such as India, who had a profound effect on total worldwide emissions.⁵

Even though the Kyoto Protocol was somewhat effective in reducing total emissions, its affects were not enough. Environmental responsibility and awareness continued to be a rising concern among the public, even with the Kyoto Protocol in effect. As actual emissions fell short of emission goals, and with the occurrence of the largest environmental catastrophe of the decade, the British Petroleum Oil Spill,⁶ public opinion and country leaders had seen that, in fact, the impact of Kyoto Protocol was not as far reaching and effective as country representatives had planned.

As of December 2015, the Conference of Parties (COP), which is the supreme decision-making body of the United Nations Convention on Climate Change,⁷ created the first legally-binding document between parties to reduce emissions not only in their own countries, but to help underdeveloped countries reduce theirs. The COP did this by having

⁴ "Kyoto Protocol." *United Nations Framework Convention on Climate Change*, unfccc.int/kyoto_protocol/items/2830.php. Accessed 20 Sept. 2017.

⁵ Sanger, David E. "Bush Will Continue to Oppose Kyoto Pact on Global Warming." *The New York Times*, 12 June 2001, www.nytimes.com/2001/06/12/world/bush-will-continue-to-oppose-kyoto-pact-on-global-warming.html. Accessed 12 Nov. 2017.

⁶ *USA Today* had total costs of the BP Oil spill at roughly \$62 billion, and an article by *NPR* looking at the effects of the oil spill five years after the initial explosion noted that it will take many years until the ocean and beaches are clean, and decades before the environmental impact can be totally understood, however it has already taken a toll on ecosystems within the water and the surrounding area.

⁷ *United Nations Framework Convention on Climate Change*, United Nations Framework Convention on Climate Change, unfccc.int/bodies/body/6383.php. Accessed 11 Sept. 2017.

developed countries help provide funding to underdeveloped countries in their sustainability efforts through the Paris Accord, as some of these countries are large emission contributors. The Paris Accord commits countries to the general reduction of emissions through a country's individual proposal, sets specific goals and targets, and mandates regular reports on progress and activity to the UNCCC relating to carbon emissions and implementation efforts with reassessments of these activities every five years.⁸ This mandated follow-up process, and the inclusion plan of funding developing countries are a couple of the aspects the Kyoto Protocol lacked. With the Paris Accord agreement, a framework for transparency and more accurate reporting was set in place to hold involved parties accountable.

The Paris Accord and the Kyoto Protocol, although a great start to putting the Earth back on an environmentally sustainable path, only accounts for emissions production. While a big part of environmental sustainability relies on reduced emissions production, it excludes other factors such as water use, sustainable farming practices, and efficient waste degradation that also significantly contribute to the overall sustainability of the Earth.

1.1.2. Change in the Stakeholder Opinion

There has also been an increased interest in the investing public to engage in sustainable, responsible, impact (SRI) investing. This new strategy of investing has transformed from niche to mainstream and has gained immense popularity throughout the

⁸ "Climate: Get the Big Picture." *United Nations Framework Convention on Climate Change*, UNFCCC, bigpicture.unfccc.int/#content-the-paris-agreemen. Accessed 20 Sept. 2017.

years. The United States Sustainable Investing Forum (USSIF) defines SRI investing as “an investment discipline that considers environmental, social, and corporate governance (ESG) criteria to generate long-term competitive financial results and a positive impact.”⁹ The dollar amount invested in SRI stocks has increased by 22% from 2009 to 2012, 76% from 2012 to 2014, and 33% from 2014 to 2016; in 2015 for every \$5 dollars invested under professional management in the U.S., was \$1 invested in a stock that met SRI criteria, in comparison to \$1 for every \$9 invested in 2012.¹⁰ In a survey done by Morgan Stanley in 2016, they received 402 responses from U.S. asset management firms with at least \$50 million worth of assets about their incorporation of SRI investing. They found that 65% of respondents are currently managing SRI investments and if they were not already, 19% work at firms who plan to do so, and 52% believed adoption of SRI practices will increase in the next five years. SRI fund options are now even being encouraged to be included in retirement plans.¹¹

Asset managers and other users of SRI funds rank these funds based on rating systems such as the Morgan Stanley Capital International (MSCI) ESG database which is used in this study. Investors use these scores to determine what stock is best to invest their money towards in their ultimate goal of supporting sustainable, socially responsible companies.

⁹ *USSIF: The Forum for Sustainable and Responsible Investment*, www.ussif.org/index.asp. Accessed 2 Sept. 2017.

¹⁰ “US Sustainable, Responsible, and Impact Investing Trends 2016”, *USSIF: The Forum for Sustainable and Responsible Investment*

¹¹ “US Sustainable, Responsible, and Impact Investing Trends 2016.” *USSIF: The Forum for Sustainable and Responsible Investment*

As SRI investing has become more popular, consumers are also showing their preference for eco-friendly and eco-efficient companies. There is evidence supporting the notion that consumers are more attracted to eco-friendly products, and willing to pay a premium price for it. This is especially true in the younger generations that, over the years 2009-2012, had a ten-percentage point increase in willingness to pay extra,¹² with a sustained increase of willingness to pay into the year 2015. Almost even more important than the eco-friendliness of a product is the brand/reputation of a company. When a company has a trusted brand, not only are consumers willing to pay more for that product, but the reputation of the company opens up business opportunities. For example, a company can pair with a non-profit, which will make it more likely for that company to be accepted into new communities, extending and solidifying their reputation.¹³ As younger generations come into more consumer power, their buying tendencies for products from trusted, reputable brands will lead to an increase in sales because of their willingness to pay and the increased volume of millennials consumers.

These two forces of governmental and stakeholder influence, have given rise to a corporation's need to both mandatory and voluntary disclose their environmental performance and efforts. This newly motivated reporting, increase in SRI investing and

¹² Goldstein, David. "Green Still Follows Green The Environment Retains Influence on Spending." *The Harris Poll*, 30 May 2012, www.theharrispoll.com/politics/Green_Still_Follows_Green__The_Environment_Retains_Influence_on_Spending.html. Accessed 5 Oct. 2017.

¹³ "The Sustainability Imperative: New Insights on Consumer Expectations." , The Nielsen Company, Oct. 2015, <https://www.nielsen.com/content/dam/niensenglobal/dk/docs/global-sustainability-report-oct-2015.pdf>. Accessed 10 Nov. 2017.

consumer demand has built off of each other, climbing the ladder of environmental incorporation as a staple in annual reporting.

CHAPTER 2: LITERATURE REVIEW

2.1: Why Do Companies Care About Environmental Performance and Responsibility?

A majority of annual reports regarding ER and sustainability efforts remain fairly voluntary despite an increasing amount of mandated disclosure. Generally, emissions output disclosures are more mandatory while areas such as energy efficiency or environmental initiatives remain as voluntary disclosures. While little is mandated in annual reports, there is a benefit, or at least perceived benefit of including voluntary items in annual reports. As a popular topic picking up in the mid-1980s (Horváthová, 2010; Margolis, 2009), many different aspects of environmental disclosures and other corporate social responsibility categories have been tested as to the effect on firm value and financial performance. As for the theories behind voluntary disclosures, there have been two overarching theories found and proven by researchers as to why a company might voluntarily disclose information pertaining to their CSR practices. These two theories complement, and intertwine with each other, providing an operating ground for companies to practice on (Deegan, 2002).

The stakeholder theory suggests that one of a company's main objectives is to balance the demand of the stakeholders of the firm because of its reliance on the continuity of its stakeholders. Stakeholders include groups or individuals that are affected by the

company such as “stockholders, creditors, employees, customers, suppliers, public interest groups, and governmental bodies” (Roberts, 1992, pg. 597). This theory has been found to hold true, in that companies will want to, and will give into their external demands of their stakeholders in order to maintain their confidence (Roberts, 2002; Tilt, 1994; Wood and Jones, 1995; Deegan and Blomquist, 2006). Using the annual report and other modes of communication from company to stakeholder, companies can show consumers, investors, and other stakeholders that they are listening to their demands and keeping their promise in order to keep them as stakeholders.

The legitimacy theory operates on the basis that companies need to legitimize their activities to the consumer and investor public, and ensure that these activities are up to the community’s expectations. Companies will use their annual report as an avenue to legitimize their actions much like the stakeholder theory does. When companies issue an annual report, they reinforce the community’s perception about their company and show their responsiveness to environmental issues and concerns (Wilmshurst and Frost, 2000; Patten, 1992; Deegan and Rankin, 1997). Patten (1992) found this to be especially true with environmental disclosure practices. With a general increase in public demand in the consumer market for ‘environmentally-friendly’ products and public demand in the investor market for SRI companies, and the wide-use of an index that scores a company based on disclosures, performance, and efforts, many companies will want to provide additional information and appear more transparent, effectively boosting their SRI scores.

These two theories operate on and are complemented by the increase in demand and attention to environmental issues in particular. These two assumptions are evidenced

by the explosion of interest in the SRI investing approach, and the upsurge of environmental awareness amongst the public (“Sustainable Signals: The Asset Manager Perspective”; Goldstein, 2012). Not only is the increase in investor demand evidenced by the USSIF research and achievements, but by studies done on the demand for SRI stocks to be incorporated into mutual funds, 401Ks, etc., and on the performance of SRI investments compared to regular stocks. These studies have shown that these stocks are becoming more and more profitable, and even outperforming regular/ low ESG rated stocks (Galema et al., 2008; “Sustainable Investing: The Millennial Investor,” 2014).

This rise in demand of the environmental responsibility of companies is largely attributed to the upcoming millennial generation, and the shift of assets into women’s hands. The millennials represent a whole new force with the heavily incorporated SRI investing strategy. Millennials are expected to receive over \$30 trillion worth in assets, causing a sustained increase in SRI investing strategies (“Sustainable Investing: The Millennial Investor,” 2014; “Sustainable Signals: The Individual Investor,” 2017). There is also evidence of a gender gap in which women are more than men likely to invest in an SRI investment. As of 2009, women had control over \$20 trillion in personal wealth, which was expected to climb to \$28 trillion by 2014.¹⁴ However, the gender gap is slowly closing,¹⁵ making the millennial factor much more impactful than the gender factor.

¹⁴ Silverstein, Michael J., and Kate Sayre. "The Female Economy." *Harvard Business Review*, Sept. 2009, <https://hbr.org/2009/09/the-female-economy>. Accessed 12 Nov. 2017.

¹⁵ “Sustainable Signals: The Individual Investor,” 2017

Public opinion on the sustainability and environmental costs on the Earth, and the positive impact a company can induce, have generally gained momentum throughout the years. A poll was sent out by Harris Interactive over the years 2009-2012 tracking public opinion on environmental issues pertaining directly to consumers. It was found that, overall, there was a nominal increase in the popularity among the adult population that considered the environmental costs of product, but the 18-24 age group had grown more likely to consider the environment when spending relative to the adult population. As stated in section 1.1.2., the 18-24 age group experienced an increase in willingness to pay for the same product by 10 percentage points. In addition to their overall concern, the Harris poll found that the 18-24 age group is also more likely to seek out environmentally friendly products and are willing to pay extra for a company's positive social responsibility. This closely aligns and complements the increase, and expected increase, among millennials in SRI investing approaches. Supporting, and elaborating on the Harris Poll report was a report by Capstrat in 2009. They found that "eighty-three percent of respondents said a company's commitment to sustainable business practices is very or somewhat important in their purchasing decisions, [and that] this concern for sustainability is not simply reflected in purchasing decisions but in everyday life." (Cohen, "Growing Public Support Sustainability). Looking beyond the years analyzed in this paper, the Nielsen Company reported on global consumer expectations regarding sustainability preferences in 2015. They found that since 2013, willingness to pay more for a product that was environmentally friendly increased the most over other sustainability factors such as the company's social

responsibility factors ("The Sustainability Imperative: New Insights on Consumer Expectations," 2015).

2.2 Previous Studies on effect of Environmental Responsibility on Financial Performance

In the literature pertaining to the environmental responsibility and financial performance relationship, there has been a moderate amount of variance in the findings. Part of this variance is due to the difference in measures and indicators of environmental responsibility. Some studies have used a scoring system on environmental disclosures (Nakao et al., 2007; Al-Tuwajri et al., 2004; Nor et al., 2015), or environmental performance or manipulated environmental performance measures to create a measure that includes multiple factors (King and Lenox, 2001; Konar and Cohen, 2001; Earnhart and Lizal, 2007; Wagner, 2005; and Elsayed and Paton, 2005). Other studies have used an environmental rating system (Ruf et al., 2001; Burnett et al., 2011). Even though there has been variation in testing and results, in a meta-analysis, Eva Horváthová (2010) found that a majority of studies have shown a positive relationship between environmental responsibility and financial performance, while insignificant findings are found the second most, and negative findings are found the least.

2.2.1 Situational Results

Looking at prior literature, there is a variance in results, finding both insignificant results, and positive/negative relationships. In most papers that find these relationships, researchers note that their results are dependent on different measures of environmental

and financial performance, and have a special relationship with time (short-term versus long-term). While some previous studies such as Cordeiro and Sarkis (1997), and Horváthová (2012) reveal a negative association in the short-term for firms who are actively pursuing environmental policies, they find that improved environmental performance leads to better financial performance in the long-run.

Other studies show that certain implementations of environmental policies, dependent on the industry, can result in a difference in the conclusion. Wagner (2005) found this to be true in his study of environmental performance on economic performance by taking recorded emissions of companies and its effect on the financial ratios: return on sales, return on capital employed, and return on equity. Looking through the lens of the European paper industry, Wagner found that when looking at the environmental-financial performance relationship, a researcher can come across a predominantly positive, neutral, or negative association because of differences in tests. Wagner notes that a more positive relationship persists when companies incorporate more environmental management policies internally that are increasing efficiency rather than heavy investments into assets that just cut emissions.

However, there are studies done that result in true null conclusions such as Earnhart and Lizal (2007) and Jaggi and Freedman (1993). Earnhart and Lizal (2007) looked at the effect of emissions on the financial measures: return on assets, return on sales, and return on equity in the Czech Republic. This study examined the years of 1995-1998 which was during the most significant decrease in emissions that the Czech Republic had, as public policy was cracking down on pollutant mitigation. They found that the financial value of

the average firm had remained unaffected, and did not provide any further explanation on this relationship. Freedman and Jaggi (1993) used water pollution as an environmental performance measure in the pulp and paper industry during the years of 1978-1983 to study the effect of environmental performance on financial performance. Freedman and Jaggi did not find enough significant data to show that water pollution had an effect on financial measures such as return on equity, return on assets, and cash flows to assets or equity. Even though Freedman and Jaggi found that there was no relationship, they noted that “if there really is no significant negative economic impact of reducing water pollution,...then there should be no question that firms can afford to reduce water pollution” (331).

Overall, there is some variance noted among prior literature that show both positive and negative associations when manipulating measurement aspects on environmental and financial performance and length of time tested. Also, it is important to note that even when studies find a true insignificance of results, it is suggestive that firms should still incorporate sustainability practices in all environmental matters as it does not affect their financial position, so instead of asking why they should do it, people should reply, why not?

2.2.2 Positive Association

More prior literature has shown that there is a positive association between environmental and economic performance. Al-Tuwaijri et al. (2005) looked at the relationship that environmental performance, environmental disclosure, and economic performance all have with each other. Looking at data from 1994 in a cross-sectional study,

Al-Tuwaijri et al. found a slightly positive relationship between environmental performance and economic performance within the S&P 500 firms. This was also found by Konar and Cohen (2001) through the S&P 500 using an emissions measure for every dollar of revenue and environmental lawsuits taken against that company as the environmental performance of a company. Burnett et al. (2011) looked among the Fortune 500 firms excluding companies in the financial, transportation, and communication industries, and also came to the conclusion of a positive association. They used a measure of external verification of eco-efficiency and whether or not that company had issued a voluntary report on their sustainability efforts as the environmental responsibility measure.

King and Lenox (2001) expanded their sample to firms that are listed on the EPA's Toxic Release Inventory database which includes all companies that own a facility that release emissions in North America, and obtains financial data based on these firms listed. Using Tobin's q as a financial measure, King and Lenox found a positive relationship between these two variables. Also using Tobin's q as a measure for financial performance, Nakao et al. (2007) found a positive relationship between financial performance and overall ER. Nakao et al. created an environmental index that scored a company's environmental management report separating overseas and domestic measures such as pollution risk, and resource cycling system of companies listed in the Japanese markets. Expanding on this relationship abroad, Küçükbay and Fazlılar (2016) found a positive relationship between accounting measures of financial performance and environmental performance based on a 3rd party scoring report in Turkey. Nor et al. (2016) also found that in a study of top market capital companies in the Malaysian market, a positive relationship existed between

environmental and financial performance using an environmental scoring index of annual reports as the environmental responsibility of a company.

As the KLD, which is now the MSCI database, measures overall corporate social responsibility efforts, there are few studies that look specifically at the environmental ratings within the database (Chatterji, 2009). My study will contribute to a more limited literature base looking specifically at ER ratings from the MSCI database rather than specific environmental performance measures, or a binary scoring system of 3rd party verification.

CHAPTER 3: HYPOTHESIS

Prior empirical research has studied environmental responsibility and economic performance through many different measures. Studies that have looked at environmental performance using strictly emissions output and toxic waste measures only capture the 'bad' that companies are engaging in. As this might have the most impact on a company's financial performance, it leaves out other factors that have an indirect effect on the financial performance of a company such as environmental policy implementation and management or the value that an eco-friendly product has on the company. Using the MSCI ESG database, which has come to be widely established, will eliminate the variance in environmental performance measures and incorporate missed effects on environmental responsibility.

Prior literature have also used environmental responsibility indicators similar to the MSCI ESG database. These studies used a 3rd party recognition by either rating or

certification. These methods included using the ratings given by Innovest (Blank and Daniel, 2002; Derwall et al. 2005; Guenster et al. 2011) or adoption of ISO14000 (Hibiki et al., 2003; Halkos and Sepeptis, 2007). Innovest uses a similar rating system as MSCI ESG, but is more simplistic, and was also not as popular as the MSCI ESG index;¹⁶ and the ISO certification is awarded to companies that implement and meet certain requirements of environmental management, but a certification does not capture the effects of weaknesses like the MSCI ESG index does. Although these two measurements are specific to their own respective criteria, the limitations regarding the complexity of scoring ER are true for other rating systems and 3rd party certifications. Even though these environmental performance indicators are valid measurements to be used in a study of the environmental responsibility-financial performance relationship, the MSCI ESG database provides a more in depth, respected and broad rating than a majority of those types of rating systems or certifications (Viehs, 2015).

This database, which will be discussed in further detail in the subsequent section, accounts for the possible indirect effects than doing a straight measure of environmental performance might miss, and provides a better understanding of the total breadth of a company's environmental impact. Using the MSCI ESG database and the ratios return on assets and Tobin's q to measure financial performance, I will test the following hypotheses:

¹⁶ MSCI Inc. acquired Innovest in 2010, along with a long history of acquisitions, making MSCI the most widely-used database for screening for ESG criteria. Source: <https://www.msci.com/our-story>

H₁: There is a positive relationship between one-year lagged Environmental Score and ROA

H₂: There is a positive relationship between one-year lagged Environmental Score and Tobin's q

I will be lagging environmental scores in order to reflect that increased financial performance and increased ER scores are not a simultaneous event (Konar and Cohen, 2001; Delmas et al., 2015; Horváthová, 2012; Horváthová, 2010; Earnhart and Lizal, 2007). I hypothesize that there will be a positive relationship based on the disproportionate evidence in favor of a positive association as evidenced in section 2.2.2 and the consumer and investor public trends evidenced in section 1.1.2. The ROA and Tobin's q ratios are used in order to reflect an accounting and market based measure that is commonly used by investors and other financial statement users. These ratios are discussed in more detail in the following section.

After testing these two hypotheses, I will look further into the effect of positive versus negative ER scores on ROA and Tobin's q. A majority of prior literature looks at total negative ER scores and the effects on financial performance. This study will contribute to the nominal academic research done on the relationship between positive, negative and net ER with financial performance. I suspect that negative scores will be more impactful than negative scores as extensive research has been done on the effect of bad news versus good news on the human brain (Soroka, "Why Do We Pay More Attention to Negative News?"; Baumeister et al., 2001). I will test the following hypotheses.

H₃: One-year lagged negative ER scores have a stronger impact on ROA than one-year lagged positive ER scores

H₄: One-year lagged negative ER scores have a stronger impact on Tobin's q than one-year lagged positive ER scores

CHAPTER 4: METHODOLOGY

4.1 Data Sources

4.1.1 Measuring Environmental Responsibility

For this study, I will be using the MSCI ESG scoring index database for the measure of environmental responsibility. This database was formerly known as the KLD Index, and switched to the MSCI Index in 2011. The MSCI database scores overall ESG factors separately then nets the positive scores and negative scores based on their own topics and subcategories. This database provides an overall look into the corporate, social responsibility of a company, so, for this study, I will separate the ER scores from the governance and social responsibility scores in order to look specifically at the impact of the environmental ratings on financial performance. After the net of the positive scores was taken, I divided by the number subcategories, 6, to be able to compare them properly to the negative scores; for the negative scores, I divided the 7 subcategories. Then, the net of the strengths and concerns were computed to compare with financial performance measures in testing H₁ and H₂, and remained separate for H₃ and H₄ (Chatterji et al., 2009).

Within the strengths scores are ratings based on subcategories of beneficial products and services, pollution prevention, recycling, clean energy, management systems,

and other strengths which could include a firm's policies on environmental management. Subcategories of concerns include regulatory problems, substantial emissions, impact on climate change, negative impact of products and services, land use and biodiversity, non-carbon emissions, and other concerns related to environmental impact. Further description on these subcategories can be seen in Table A1 in the Appendix. Scoring these categories is a team dedicated to the daily monitoring of these companies and related ESG events. This team uses a binary system in scoring a company with a rules-based methodology on public datasets, company disclosures and annual reports, and media sources assigning a value of 0 if the criteria is not met or 1 if it is.

As you can see from the magnitude of topics that go into the total environmental rating of a company, it could be considered a better reflection of environmental performance than a strict quantitative measure such as a formula of toxic waste output.

However, there are a few limitations with the MSCI ESG database. The scoring technique employed by the MSCI ESG team is unclear as it is a proprietary process; however, this database has gained integrity as a legitimate database as noted by the wide use of these ratings, the affiliation with the asset manager giant Morgan Stanley, and the use with other firms and asset managers including Bloomberg, Goldman Sachs, and JP Morgan. Because this scoring technique uses a binary scoring method, the magnitude of strengths and concerns are limited. In addition, because this database is dedicated to an overall scoring of corporate social responsibility, it will have less resources dedicated to the environmental portion, which, when looking strictly at environmental responsibility, may result in a weaker measurement of environmental strengths and concerns.

4.1.2 Measuring Financial Performance

Prior literature in measuring financial performance has split performance ratios into two different approaches: market-based and accounting-based. Market-based ratios relate a firm's market value to the firm's stock price and book values from certain financial statement items. Common market-based ratios include the Market-to-Book ratio, the Price-Earnings ratio, the Dividend yield, and Tobin's q. Accounting-based ratios give financial statement users a measure of the efficiency and profitability of a company's management practices of assets and liabilities in their operations. Common ratios users utilize when evaluating a company are profitability ratios including Return on Assets and Return on Equity, and Asset Management ratios such as Asset Turnover.

In order to measure financial performance for this study, the Return on Assets (ROA) and Tobin's q ratios have been chosen. The ROA ratio will measure as the accounting based ratio and the Tobin's q ratio will measure as the market based ratio. Although not the most common ratio, Tobin's q has been used in numerous studies regarding the environmental responsibility-financial performance relationship (King and Lenox, 2001; Nakao et al., 2007; Guenster et al., 2011; Hibiki et al., 2003; Delmas et al., 2015; Wagner, 2010), and has been proven as a legitimate market based valuation ratio (Varaiya et al., 1987).

ROA is measured as the net income of a company divided by their average total assets. This ratio specifically measures a company's efficiency of managing its assets and their ability to utilize them in generating net income. Commonly, return on equity (ROE)

is used as the most powerful measure in company efficiency, however, ROA “avoids the potential distortions created by financial strategies,” and has been proven to “highlight the importance of capability leverage options,” according to Hagel III, Brown and Davison in “The Best Way to Measure Company Performance.” In addition, they note that ROA gives the user a better understanding of the fundamentals of that company's business.

Tobin’s q is measured by taking the market value of equity and adding total long-term debt and net current liabilities, and dividing that sum by total assets. This ratio reflects the market value of a firm to the replacement costs of tangible assets and is an indicator of under or overvaluation of a firm. Theoretically, a Tobin’s q above 1 means that a firm is overvalued because its market value is higher than the total assets of that firm. I will use the simplified measure of Tobin’s q, as it has been proven that using the simplified measure does not have a significant difference compared to using the original, more complex formula (Dowell, 2000; King and Lenox, 2001).

4.2 Sample Size

In this sample, I use companies included in the MSCI ESG database, and cross-reference their scores with companies included in the S&P 500. I omitted companies that had incomplete data from the years 2008-2011 either due to the MSCI ESG database, or the COMPUSTAT database. After these omissions, my sample was left with 287 companies across the years of 2008-2011 to be used in the study. A complete list of the 287 companies can be found in Table A2 in the Appendix.

4.3 Independent, Dependent, and Control Variables

In this sample, I test the effect of one-year lagged net, positive, and negative totals of ER to the ROA and the Tobin's q ratio. In all of the hypotheses tested, the lagged ER score is the independent variable. I lag the ER indicator in order to reflect that there are more benefits associate with this relationship in the long-term versus the short-term (Horváthová, 2012; Chetterji et al., 2009). The dependent variables in hypotheses 1 and 3 is ROA, Tobin's q in hypotheses 2 and 4.

In order to address bias in my model, I control for different industries as they have been found to have a significant effect on environmental responsibility. Some industries are more susceptible to environmental concerns that will give them a higher negative score over a firm in the banking and finance industry, who will have a more positive score because of initiatives taken to reduce their environmental impact without really having a negative impact in the first place. Industries were assigned a dummy variable for this study.

I will also control for firm size in this study. While environmental responsiveness has been proven to be insignificant with firm size (Darnall et al., 2010; Stanwick and Stanwick, 1998; Elsayed, 2006), there has been different implications for corporate sustainable responsibility performance and environmental performance (Udayasankar, 2007; Roy et al., 2001). Roy et al. (2001) suggests that "larger firms have greater access to resources, both financial and human, and can therefore put more effort into reducing environmental impacts" (260-261). As both environmental responsiveness and environmental impact are measured indirectly or directly in the MSCI ESG ratings, I will

control for firm size using the market value and number of employees of a company provided by COMPUSTAT.

CHAPTER 5: RESULTS

Table 1 provides descriptive statistics for this study's dependent, independent and control variables; industry data is included in Table 2. ER is based on a scale of -100-100, with 100 representing a firm that meets the criteria in order to be assigned a 1 in all of the strength categories, and meeting none of the criteria in order to be assigned a 1 in any of the concerns categories, and vis-a-versa for a score of -100. With a mean for the lagged ER of 5 on this scale, this suggests that on average, more firms are meeting more criteria for environmental strengths than environmental concerns.

In Table 2 you can see average ER scores for each industry. Industries are categorized using the Standard Industrial Classification Code range. Interesting to note that, although low, the manufacturing industry had the highest average ER score of 12, which is typically an industry you would expect to have more concerns than strengths. This could be conducive to an overall positive change in mitigating the ER concerns of the manufacturing industry. The other industries that had on average more environmental strengths than concerns over the years 2008-2011 were the construction; retail trade, finance, insurance, and real estate; and services industries. Industries with more overall weaknesses included agriculture, forestry, and fishing; mining; transportation, communications, electric, gas and sanitary service; and other non-classifiable industries. The only industry to have an average net ER score of 0 was the wholesale trade industry.

However, with some of these industries, it is difficult to make an accurate conclusion because of small sample sizes within each industry. For example, the agriculture, forestry, and fishing industry only have one observation, and it is difficult to make an assumption about the average ER of that industry as a whole.

Table 1: Descriptive Statistics of one-year lagged ER score with financial data for the years 2008-2011

Variable	N	Mean	Std. Dev.	Min	Max
ROA	287	0.07	0.06	(0.11)	0.27
Tobin's Q	287	1.72	1.01	0.10	7.35
ER Score	287	5	19	(55)	67
Total Assets	287	26,160	57,181	918	762,011
Net Income	287	1,485	3,334	(2,897)	34,005
No. Emp.	287	43	66	1	414
Market Value	287	23,439	40,763	1,913	371,222
EPS	287	2.56	2.40	(3.56)	14.54

Table 2: Industry Classification

Industry	SIC Code	N	ER Score	Min	Max
Agriculture, Forestry and Fishing	100-999	1	(24)	(24)	(24)
Mining	1000-1499	28	(13)	(55)	17
Construction	1500-1799	6	5	(10)	13
Manufacturing	2000-3999	145	12	(49)	67
Transportation, Communications, Electric, Gas and Sanitary service	4000-4999	49	(5)	(45)	31
Wholesale Trade	5000-5199	5	0	(14)	8
Retail Trade	5200-5999	13	7	(14)	42
Finance, Insurance and Real Estate	6000-6799	6	6	0	13
Services	7000-8999	32	7	0	42
Non-classifiable	9900-9999	2	(16)	(34)	1

The correlation matrix in Tale 3 can provide some insight into the relationship between the ER scores and the financial measures ROA and Tobin's q. ER is significantly correlated with ROA and Tobin's q at the $p < .05$ and $p < .01$ levels respectively. However, ER scores do not have a large impact on ROA and Tobin's q as the correlation coefficient lies at .15 for ROA and .16 for Tobin's q.

Table 3: Correlation Matrix for one-year lagged ER scores with financial data for the years 2008-2011

	ROA	Tobin's Q	ER LAG	Total Assets	Net Income	No. Emp.	Market Value	EPS
ROA	1							
Tobin's Q	.74**	1						
ER LAG	.15*	.16**	1					
Total Assets	(0.07)	(.19)**	(0.09)	1				
Net Income	.27**	0.03	(0.02)	.65**	1			
No. Emp.	0.06	(0.01)	.19**	.47**	.43**	1		
Market Value	.22**	0.05	0.01	.68**	.96**	.47**	1	
EPS	.56**	.21**	(0.05)	0.07	.36**	.14*	.30**	1

***Significant at the 0.001 level

**Significant at the 0.01 level

*Significant at the 0.05 level

Running a multivariate regression, Hypothesis H_1 accepted, showing that one-year lagged ER scores have a relationship with ROA, while H_2 was rejected, suggesting that one-year lagged net ER scores do not have a statistically significant relationship with Tobin's q. ROA was found to be statistically significant the $p < .01$ level. ROA had a positive relationship with net ER, although the effect of ER was fairly minimal; for every one-point increase in ER (i.e. 0 to 1), ROA increases by .0432 percentage points. Results of the two tests can be seen in Table 4.

Table 4: Regression output of dependent variables ROA and Tobin's q and the effects of one-year lagged ER data for the years 2008-2011.

Dependent Variable	ROA	Tobin's q
Independent Variable		
ER LAG	0.043** (.017)	0.312 (0.326)
Controls		
Total Assets	-2.9E-07*** (8.53E-08)	-5.9E-06*** (1.64E-06)
Net Income	4.05E-06 (3.11E-06)	-1.95E-04** (5.96E-05)
No. Emp.	-8.50E-05 (5.25E-05)	-0.0023* (0.001)
Market Value	1.12E-07 (2.58E-07)	2.19E-05*** (4.94E-06)
EPS	0.01*** (0.0013)	0.08** (0.0245)
Observations	287	287
Adj. R	42.77%	26.02%

***Significant at the 0.001 level

**Significant at the 0.01 level

*Significant at the 0.05 level

Further analysis on the specific effects of positive scores and negative scores for ROA and Tobin's q can be seen in Tables 5(a) and 5(b). Both ROA and Tobin's q had a statistically significant negative relationship with one-year lagged negative ER scores ($p < .001$), so both H_3 and H_4 are accepted and supported. For every one-point decrease in ER score (i.e. 0 to -1), ROA decreased by .0873 percentage points, and Tobin's q decreased

1.45 basis points. Only Tobin's q had a statistically significant relationship with positive ER scores ($p < .05$), and was negatively associated, so that for every one-point increase in positive ER score, Tobin's q decreased by 1.05 basis points.

In these tests of ROA and Tobin's q, both R^2 percentages rose when looking at negative versus positive ER scores. This shows that the variance in both models for ROA and Tobin's q, can be further explained more in the negative ER score tests than the positive ER score tests.

The correlation matrix on separated ER scores can be seen in Table 6. The correlation coefficient between negative ER scores and Tobin's q is high at .334 and is statistically significant ($p < .01$), while positive ER scores were significant with Tobin's q ($p < .01$) at .174. Negative ER scores are also statically significant with ROA ($p < .01$) at -.17. One interesting correlation to note is that the number of employees at a firm is significantly correlated with positive ER at the $p < .01$ level with a correlation coefficient of .33. As an indicator of firm size, it is likely that this could be explained by the idea that the bigger the company is, the more publicity they attract, so those firms will want to be a good company in the eyes of their stakeholders (Al-Tuwajjri et al., 2004).

Table 5(a): Regression output of dependent variable ROA and the effects of one-year lagged positive ER and negative ER for the years 2008-2011

Dependent Variable	ROA	
	Test 1	Test 2
Independent Variable		
Lag Positive ER	-0.0288 (0.0204)	
Lag Negative ER		0.0873*** (0.0194)
Controls		
Total Assets	-3.0E-07*** (8.61E-08)	-2.5E-07** (8.41E-08)
Net Income	2.96E-06 (3.1E-06)	5.93E-06 (3.08E-06)
No. Emp.	-3.6E-05 (5.34E-05)	-5.68E-05 (4.99E-05)
Market Value	2.06E-07 (2.57E-07)	6.42E-09 (2.53E-07)
EPS	0.011*** (0.0013)	0.011*** (0.0013)
Observations	287	287
Adj. R ²	41.83%	45.46%

***Significant at the 0.001 level

**Significant at the 0.01 level

*Significant at the 0.05 level

Table 5(b): Regression output of dependent variable Tobin's q and the effects of one-year lagged positive and negative ER score for the years 2008-2011

Dependent Variable	Tobin's q	
	Test 1	Test 2
Independent Variable		
Lag Positive ER	-1.05** (0.3829)	
Lag Negative ER		1.45*** (0.3721)
Controls		
Total Assets	-5.67E-06*** (1.62E-06)	-5.03E-06** (1.61E-06)
Net Income	-2.0E-04*** (5.82E-05)	-1.52E-05** (5.9E-05)
No. Emp.	-1.41E-03 (0.001)	-2.15E-03* (0.001)
Market Value	2.54E-05*** (4.83E-06)	1.93E-05*** (4.84E-06)
EPS	0.0765** (0.0242)	0.0821*** (0.024)
Observations	287	287
Adj. R ²	27.77%	29.70%

***Significant at the 0.001 level

**Significant at the 0.01 level

*Significant at the 0.05 level

Table 6: Correlation Matrix for one-year lagged negative and positive ER scores and financial data for the years 2008-2011

	ROA	Tobin's Q	Net ER	Pos. ER	Neg. ER	Total Assets	Net Income	No. Emp.	Market Value	EPS
ROA	1									
Tobin's Q	.74**	1								
Net ER	.15*	.16**	1							
Pos. ER	-0.01	-.17**	.54**	1						
Neg. ER	.17**	.33**	.60**	-.35**	1					
Total Assets	-0.08	-.19**	-0.09	.31**	-.39**	1				
Net Income	.27**	0.03	-0.02	.34**	-.34**	.65**	1			
No. Emp.	0.06	-0.01	.19**	.33**	-0.10	.47**	.43**	1		
Market Value	.22**	0.06	0.01	.34**	-.31**	.68**	.96**	.47**	1	
EPS	.56**	.21**	-0.05	0.09	-.15*	0.07	.36**	.14*	.30**	1

***Significant at the 0.001 level

**Significant at the 0.01 level

*Significant at the 0.05 level

CHAPTER 6: DISCUSSION AND CONCLUSION

ROA, Tobin's q, and Net ER

Strictly looking at the relationship between net ER scores and the financial measures, there is an expected positive relationship with financial performance as hypothesized in H_1 and H_2 . Although not very strong, environmental performance of the previous year only affected ROA significantly which supported H_1 . This finding was supported by Nakao et al. (2007), Nor et al. (2016), Delmas (2015). However, H_2 was found to be insignificant supporting the findings of Wager (2005), Earnhart and Lizal (2007), and Freedman and Jaggi (1993). The differing results might be explained by the definitions and difference of measures in financial performance (Wager, 2005). While ROA focuses more on net income and revenues relative to assets, it reflects more of management's ability to generate profits based on these assets, while Tobin's q reflects more of the market's perception of that company. In addition, the market could possibly take longer than one-year to recognize the true impact a company's ER.

Because ROA is an accounting measure and takes into account revenues more than Tobin's q does, this provides evidence that the consumer public is valuing a company's brand and ER more than the market and investing public does. As evidenced in section 1.1.2, millennials exhibit a stronger reactive relationship to the ER of a company. Consequently, as millennials come of age and start to dominate markets, companies could see a rise in financial performance looking through the lens of not only ROA, but other profitability measures (Ruf et al., 2001). However, further research should be done to look

into the effects of net ER, taking into account both positive and negative environmental impacts of a company with other profitability ratios.

H₂ was found not to be significant, this negates findings of King and Lenox (2001), Nakao et al. (2007), Delmas (2015), and Konar and Cohen (2001); however, it is only negated to the extent that these studies look at negative environmental performance with Tobin's q. This relationship will be further discussed in section 6.3, as separating positive and negative scores provide further insight into this finding.

Positive Versus Negative ER and ROA

The specific effects of negative ER scores on ROA became more significant and impactful on financial performance than the net ER score. Interestingly, the positive score became insignificant; however, the relationship became negative, suggesting that there is a decrease in ROA and profitability when spending on ER initiatives increases. It is important to note that this might be due to the time lag of only one year. As mentioned in section 6.1, companies might experience an increase in revenues and net income from the consumer public, however, money spent on facilities and other initiatives can negate this increase from net income, and increase average total assets having an amplified impact on ROA. When companies invest in their property, plant and equipment, such as investing in a new eco-efficient facility, will almost immediately increase a company's positive ER score once the facility is in use. Unfortunately, a company will not see a profitability increase until years if not decades later when the amount of savings from the new facility

start to pay off.¹⁷ Companies will see an increase in average assets, while not having a subsequent drop in operating costs of the facility; this will lead to a decreased ROA.

Positive Versus Negative ER and Tobin's Q

With Tobin's q, the net ER was found to be insignificant, yet the specific effects of both positive and negative ER had a significant impact on Tobin's q. This suggests that firms who had a negative score also had positive scores to help balance the effect, which is supported by the strong correlation (-.35) between negative and positive environmental scores, evidenced in Table 6; this is supported by the findings of Chatterji (2007). Looking specifically at positive ER scores, ROA and Tobin's q were affected similarly, suggesting that in the short-run, positive ER initiatives and spending decreased financial performance. This is evidenced in the facilities example explained in section 6.2 which also applied to Tobin's q. These facilities, causing an increase in total assets, will decrease Tobin's q. Amplifying the affect again, net income will lower in the earlier years, leading to a decrease in Shareholder's Equity. Negative ER scores also had a similar impact on ROA and Tobin's q. The negative score had a significant impact on Tobin's q, which, previously not consistent, is now consistent with King and Lenox (2001), Nakao et al. (2007), Delmas (2015), and Konar and Cohen (2001) who all used inherently negative scores of ER. The negative ER score impact was so much higher relative to positive ER that it outweighed the costs of implementing positive ER initiatives, as seen by the positive association when looking at net ER scores. This shows that the market reacts strongly to the negative impacts

¹⁷ Clarke, Richard A., Robert N. Stavins, J. Ladd Greeno, Joan L. Bavaria, and Frances Cairncross. "The Challenge of Going Green." *Harvard Business Review*, Aug. 1994, <https://hbr.org/1994/07/the-challenge-of-going-green>.

of a company in the short-run. The strong reaction to negative news of both ROA and Tobin's q supports hypotheses H_3 and H_4 , which also supports research done on negative news and the human brain (section 3). Both the negative association with positive ER and ROA and Tobin's q in the short-run is supported by findings Horváthová (2012) and Cordeiro and Sarkis (1997).

The phenomenon that positive and negative ER scores are significant while, the net of them are not, could also be explained by looking at the case of Weyerhaeuser Company. Weyerhaeuser Company is a natural resources company working with lumber, land and minerals, wood products, and energy. Weyerhaeuser, although an inherently negative ER company, they do their part with sustainability programs in which they plant trees, manage the forests they use, and source their own energy for their facilities.¹⁸ In my sample, they had a positive ER score of 58, negative ER score of 32, ROA of 1%, and Tobin's q of .989. While they had a stronger positive ER score, Weyerhaeuser had a negative ROA and Tobin's Q supporting the results from the regression as seen in Tables 5(a) and 5(b). However, with Tobin's q, the perceived worth of the company was still only .11 below 1 indicating that Weyerhaeuser is just below neutral valuation. When looking at the net effects, although the score of Tobin's q was fairly neutral, supporting H_2 , and ROA was low supporting the minimal significance of H_1 .

¹⁸ *Weyerhaeuser*, Weyerhaeuser NR Company, <https://www.weyerhaeuser.com/>. Accessed 1 Dec. 2017.

6.1 Implications

Using the specific results found supporting H_3 and H_4 , there are implications for managers and other corporate officers handling a company and its reputation. Companies should note that negative news and reputation not only strongly affect a stakeholder's perception of the company, but the financial performance in both consumer and investor markets. Because of this they should mitigate the number and magnitude of environmental concerns their company has as much as possible. This does not mean companies should just exclude voluntary information on environmental concerns from annual reports, supplementary reports, etc., companies will in effect hurt their own reputation, and lose trust of stakeholders, ruining their legitimacy as a trustworthy company. In addition, this study was done during the Great Recession, which, with results found, shows that even while financial markets are in some of their worst times, consumers and investors still had a significant interest in the overall ER of a company, meaning that there is never a time in which a company should ignore their ER.

Companies should also note that in order to mitigate worsening financial performance from negative environmental impacts, they should do their best to bring their net ER effects to 0. Although they will be spending more funds on ER initiatives, and further worsen their current financial position, the benefit they will gain from 'cancelling out' these negative scores will outweigh the costs to implement positive environmental impact. In a nutshell, negative ER, although may be the more cost-effective option, hinders your financial performance in the public markets more than spending on positive ER initiatives.

6.2 Further Research

Further research done on this topic should look deeper into the effects of different lagged years. Since positive ER tends to take more time to affect financial performance than negative ER, looking at this relationship with further lagged years will help see the positive impacts ER can have on financial performance. In addition, using more measures of financial performance will help managers and investors that may be skeptical of this relationship see that ER has a strong effect on financial performance, and subsequently start to incorporate sustainable responsibility into their own decision-making, turning a profit while making a positive impact. Furthermore, it would be interesting to see the effect that the Paris Accord will have on this relationship, as a lot of corporate giants, such as Apple and Google, are committing themselves to this agreement as well. It seems that this will have a positive effect on this relationship, however, as of 2017, more time needs to pass in order to see more long-term effects.

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Appendix

Table A1:

STRENGTHS
1. Beneficial Products and Services: This indicator measures the positive environmental impact of a firm's products and/or services. Factors affecting this evaluation include, but are not limited to, products/services that reduce other firms' and individuals' consumption of energy, production/consumption of hazardous chemicals, and overall patterns of resource consumption.
2. Pollution Prevention: This indicator measures a firm's method of mitigating non-carbon air emissions, water discharges, and solid waste from its operations. Factors affecting this evaluation include, but are not limited to, initiatives to reduce a firm's non-carbon air emissions from its operations; to reduce the release of raw sewage, industrial chemicals, and other regulated substances; to reduce hazardous and non-hazardous waste; and programs to reduce the use of packaging materials, to support recycling; and to recycle old products such as televisions and other consumer electronics.
3. Recycling: This indicator measures a firm's use of recycled materials in its products/services. Factors affecting this evaluation include, but are not limited to: assessment of the volume and recycled content of products made with recycled input materials, including paper, metal, plastic; and any certification of its practices by a third party, such as the Forest Stewardship Council for timber product companies.
4. Clean Energy: This indicator measures a firm's policies regarding climate change. Factors affecting this evaluation include, but are not limited to, acknowledgement of direct and/or indirect impacts on operations due to climate change and formal commitments to: reduce greenhouse gas emissions; and initiatives to reduce energy consumption and to increase the use of renewable energy.
5. Management Systems: This indicator measures a firm's monitoring and management of its environmental practices. Factors affecting this evaluation include, but are not limited to, the establishment and monitoring of environmental performance targets, the presence of environmental training and communications programs for employees, and stakeholder engagement.
6. Other Strength: This indicator measures a firm's environmental management policies. Factors affecting this evaluation include, but are not limited to, a stated commitment to: integrate environmental considerations into all operations; reduce environmental impact of operations, products and services; and comply with regulations.

CONCERNS

1. **Regulatory Problems:** This indicator measures a firm's record of compliance with environmental regulations. Factors affecting this evaluation include, but are not limited to, fines/sanctions for causing environmental damage, and/or violations of operating permits.

2. **Substantial Emissions:** This indicator measures a firm's emission of toxic chemicals according to data from the Toxics Release Inventory (TRI), a U.S. Environmental Protection Agency (EPA) database of information on toxic chemical releases and waste management activities. Factors affecting this evaluation include, but are not limited to, how the firm compares to its industry peers.

3. **Climate Change:** This indicator measures the severity of controversies related to a firm's climate change related policies and initiatives. Factors affecting this evaluation include, but are not limited to, a history of involvement in greenhouse gas (GHG)-related legal cases, widespread or egregious impacts due to corporate GHG emissions, resistance to improved practices, and criticism by nongovernmental organizations (NGOs) and/or other third-party observers. In addition, factors cover whether a company derives substantial revenues from the sale of coal or oil and its derivative fuel products, or whether the company derives substantial revenues indirectly from the combustion of coal or oil and its derivative fuel products.

4. **Negative Impact of Products & Services:** This indicator measures the negative environmental impact of a firm's products and/or services. Factors affecting this evaluation include, but are not limited to, products/services that involve regulated substances, the production/consumption of hazardous chemicals, and controversial products such as those that use genetically modified organisms or nanotechnology.

5. **Land Use & Biodiversity:** This indicator measures the severity of controversies related to a firm's use or management of natural resources. Factors affecting this evaluation include, but are not limited to, a history of involvement in natural resource-related legal cases, widespread or egregious impacts due to the firm's use of natural resources, resistance to improved practices, and criticism by NGOs and/or other third-party observers.

6. **Non-Carbon Emissions:** This indicator measures the severity of controversies related to a firm's non-GHG emissions. Factors affecting this evaluation include, but are not limited to, a history of involvement in land, air, or water emissions-related legal cases, widespread or egregious impacts due to corporate non-GHG emissions, resistance to improved practices, and criticism by NGOs and/or other third-party observers.

7. **Other Concern:** This indicator measures the severity of controversies related to a firm's environmental impact. Factors affecting this evaluation include, but are not limited to widespread or egregious environmental impacts, resistance to improved practices, criticism by NGOs and/or other third-party observers, and any other environmental controversies not covered by other environmental ratings.

Table A2:

	Company Name	Ticker
1	Agilent Technologies Inc.	A
2	Apple Inc.	AAPL
3	AmerisourceBergen Corp	ABC
4	Abbott Laboratories	ABT
5	Adobe Systems Inc.	ADBE
6	Analog Devices	ADI
7	Archer-Daniels-Midland Co	ADM
8	Automatic Data Processing	ADP
9	Ameren Corp	AEE
10	American Electric Power Co	AEP
11	Aes Corp	AES
12	Allergan Plc	AGN
13	Akamai Technologies Inc.	AKAM
14	Alexion Pharmaceuticals Inc.	ALXN
15	Applied Materials Inc.	AMAT
16	Advanced Micro Devices	AMD
17	Amgen Inc.	AMGN
18	American Tower Corp	AMT
19	Amazon.Com Inc.	AMZN
20	AutoNation Inc.	AN
21	Apache Corp	APA
22	Anadarko Petroleum Corp	APC
23	Air Products & Chemicals Inc.	APD
24	Amphenol Corp	APH
25	Apollo Education Group Inc.	APOL
26	Allegheny Technologies Inc.	ATI
27	Avon Products	AVP
28	Avery Dennison Corp	AVY
29	AutoZone Inc.	AZO
30	Boeing Co	BA
31	Baxter International Inc.	BAX
32	Bard (C.R.) Inc.	BCR
33	Becton Dickinson & Co	BDX
34	Baker Hughes Inc.	BHI
35	Biogen Inc.	BIIB
36	Ball Corp	BLL
37	Bemis Co Inc.	BMS
38	Bristol-Myers Squibb Co	BMJ
39	Broadcom Corp	BRCM

40	Boston Scientific Corp	BSX
41	Peabody Energy Corp	BTU
42	BorgWarner Inc.	BWA
43	Cardinal Health Inc.	CAH
44	Cameron International Corp	CAM
45	Caterpillar Inc.	CAT
46	CBS Corp	CBS
47	Coca-Cola European Partners	CCE
48	Crown Castle Intl Corp	CCI
49	Carnival Corp/Plc (USA)	CCL
50	Celgene Corp	CELG
51	Cerner Corp	CERN
52	CF Industries Holdings Inc.	CF
53	Chesapeake Energy Corp	CHK
54	C H Robinson Worldwide Inc.	CHRW
55	Colgate-Palmolive Co	CL
56	Cleveland-Cliffs Inc.	CLF
57	Clorox Co/De	CLX
58	Comcast Corp	CMCSA
59	Cummins Inc.	CMI
60	CMS Energy Corp	CMS
61	CenterPoint Energy Inc.	CNP
62	Consol Energy Inc.	CNX
63	Cabot Oil & Gas Corp	COG
64	Rockwell Collins Inc.	COL
65	ConocoPhillips	COP
66	Costco Wholesale Corp	COST
67	Campbell Soup Co	CPB
68	Cisco Systems Inc.	CSCO
69	CSX Corp	CSX
70	CenturyLink Inc.	CTL
71	Cognizant Tech Solutions	CTSH
72	Citrix Systems Inc.	CTXS
73	Coventry Health Care Inc.	CVH
74	CVS Health Corp	CVS
75	Chevron Corp	CVX
76	Dominion Energy Inc.	D
77	Du Pont (E I) De Nemours	DD
78	Deere & Co	DE
79	Dean Foods Co	DF
80	Quest Diagnostics Inc.	DGX
81	D R Horton Inc.	DHI
82	Danaher Corp	DHR

83	Disney (Walt) Co	DIS
84	Discovery Communications Inc.	DISCA
85	Dun & Bradstreet Corp	DNB
86	Denbury Resources Inc.	DNR
87	Diamond Offshore Drilling Inc.	DO
88	Dover Corp	DOV
89	DTE Energy Co	DTE
90	Duke Energy Corp	DUK
91	DaVita Inc.	DVA
92	Devon Energy Corp	DVN
93	Ebay Inc.	EBAY
94	Ecolab Inc.	ECL
95	Consolidated Edison Inc.	ED
96	Equifax Inc.	EFX
97	Edison International	EIX
98	Lauder (Estee) Cos Inc. -Cl A	EL
99	Emc Corp/Ma	EMC
100	Eastman Chemical Co	EMN
101	Emerson Electric Co	EMR
102	Eog Resources Inc.	EOG
103	Express Scripts Holding Co	ESRX
104	Eaton Corp Plc	ETN
105	Entergy Corp	ETR
106	Edwards Lifesciences Corp	EW
107	Exelon Corp	EXC
108	Expeditors Intl Wash Inc.	EXPD
109	Expedia Inc.	EXPE
110	Ford Motor Co	F
111	Fastenal Co	FAST
112	Freeport-McMoRan Inc.	FCX
113	Family Dollar Stores	FDO
114	FirstEnergy Corp	FE
115	F5 Networks Inc.	FFIV
116	Fiserv Inc.	FISV
117	Flir Systems Inc.	FLIR
118	Fluor Corp	FLR
119	Flowserve Corp	FLS
120	Fmc Corp	FMC
121	Fossil Group Inc.	FOSL
122	General Dynamics Corp	GD
123	General Electric Co	GE
124	Gilead Sciences Inc.	GILD
125	Corning Inc.	GLW

126	Genuine Parts Co	GPC
127	Goodyear Tire & Rubber Co	GT
128	Grainger (W W) Inc.	GWW
129	Halliburton Co	HAL
130	Harman International Inds	HAR
131	Hasbro Inc.	HAS
132	Honeywell International Inc.	HON
133	Starwood Hotels & Resorts World	HOT
134	Helmerich & Payne	HP
135	HP Inc.	HPQ
136	Hormel Foods Corp	HRL
137	Harris Corp	HRS
138	Hospira Inc.	HSP
139	Hershey Co	HSY
140	Intl Business Machines Corp	IBM
141	Intl Flavors & Fragrances	IFF
142	Intuit Inc.	INTU
143	Intl Paper Co	IP
144	Interpublic Group Of Cos	IPG
145	Iron Mountain Inc.	IRM
146	Intuitive Surgical Inc.	ISRG
147	Illinois Tool Works	ITW
148	Jabil Inc.	JBL
149	Johnson Controls Intl Plc	JCI
150	Jacobs Engineering Group Inc.	JEC
151	Johnson & Johnson	JNJ
152	Juniper Networks Inc.	JNPR
153	Kellogg Co	K
154	KLA-Tencor Corp	KLAC
155	Kimberly-Clark Corp	KMB
156	Coca-Cola Co	KO
157	Leggett & Platt Inc.	LEG
158	Lennar Corp	LEN
159	Laboratory Cp Of Amer Hldgs	LH
160	L3 Technologies Inc.	LLL
161	Linear Technology Corp	LLTC
162	Lilly (Eli) & Co	LLY
163	Lockheed Martin Corp	LMT
164	Lam Research Corp	LRCX
165	Leucadia National Corp	LUK
166	Southwest Airlines	LUV
167	Marriott Intl Inc.	MAR
168	Masco Corp	MAS

169	Mattel Inc.	MAT
170	McDonald's Corp	MCD
171	Moody's Corp	MCO
172	McCormick & Co Inc.	MKC
173	Marsh & McLennan Cos	MMC
174	3M Co	MMM
175	Altria Group Inc.	MO
176	Molex Inc.	MOLX
177	Monsanto Co	MON
178	Merck & Co	MRK
179	Marathon Oil Corp	MRO
180	Microsoft Corp	MSFT
181	Micron Technology Inc.	MU
182	Murphy Oil Corp	MUR
183	MeadWestvaco Corp	MWV
184	Mylan NV	MYL
185	Noble Energy Inc.	NBL
186	Noble Corp Plc	NE
187	Newmont Mining Corp	NEM
188	Netflix Inc.	NFLX
189	Newfield Exploration Co	NFX
190	NiSource Inc.	NI
191	Northrop Grumman Corp	NOC
192	National Oilwell Varco Inc.	NOV
193	Nrg Energy Inc.	NRG
194	Norfolk Southern Corp	NSC
195	Nucor Corp	NUE
196	Newell Brands Inc.	NWL
197	Owens-Illinois Inc.	OI
198	Oneok Inc.	OKE
199	Omnicom Group	OMC
200	O'Reilly Automotive Inc.	ORLY
201	Occidental Petroleum Corp	OXY
202	Pitney Bowes Inc.	PBI
203	Paccar Inc.	PCAR
204	PG&E Corp	PCG
205	Plum Creek Timber Co Inc.	PCL
206	Priceline Group Inc.	PCLN
207	Public Service Entrp Grp Inc.	PEG
208	PepsiCo Inc.	PEP
209	Pfizer Inc.	PFE
210	Procter & Gamble Co	PG
211	Parker-Hannifin Corp	PH

212	PulteGroup Inc.	PHM
213	PerkinElmer Inc.	PKI
214	Pall Corp	PLL
215	Pentair Plc	PNR
216	Pinnacle West Capital Corp	PNW
217	Pepco Holdings Inc.	POM
218	PPG Industries Inc.	PPG
219	PPL Corp	PPL
220	Perrigo Co Plc	PRGO
221	Quanta Services Inc.	PWR
222	Praxair Inc.	PX
223	Pioneer Natural Resources Co	PXD
224	Qualcomm Inc.	QCOM
225	Ryder System Inc.	R
226	Reynolds American Inc.	RAI
227	Rowan Companies Plc	RDC
228	Robert Half Intl Inc.	RHI
229	Rockwell Automation	ROK
230	Roper Technologies Inc.	ROP
231	Range Resources Corp	RRC
232	Donnelley (R R) & Sons Co	RRD
233	Republic Services Inc.	RSG
234	Raytheon Co	RTN
235	Sprint Corp	S
236	Starbucks Corp	SBUX
237	Scana Corp	SCG
238	Sealed Air Corp	SEE
239	Sherwin-Williams Co	SHW
240	Sigma-Aldrich Corp	SIAL
241	Schlumberger Ltd	SLB
242	Snap-On Inc.	SNA
243	SanDisk Corp	SNDK
244	Southern Co	SO
245	Stericycle Inc.	SRCL
246	Sempra Energy	SRE
247	St Jude Medical Inc.	STJ
248	Stanley Black & Decker Inc.	SWK
249	Southwestern Energy Co	SWN
250	Safeway Inc.	SWY
251	Stryker Corp	SYK
252	Sysco Corp	SYY
253	AT&T Inc.	T
254	Molson Coors Brewing Co	TAP

255	Teco Energy Inc.	TE
256	Teradyne Inc.	TER
257	Tenet Healthcare Corp	THC
258	Titanium Metals Corp	TIE
259	Thermo Fisher Scientific Inc.	TMO
260	Tyson Foods Inc. -Cl A	TSN
261	Total System Services Inc.	TSS
262	Time Warner Inc.	TWX
263	Texas Instruments Inc.	TXN
264	Textron Inc.	TXT
265	Union Pacific Corp	UNP
266	United Parcel Service Inc.	UPS
267	United Technologies Corp	UTX
268	Varian Medical Systems Inc.	VAR
269	VF Corp	VFC
270	Valero Energy Corp	VLO
271	Vulcan Materials Co	VMC
272	Verisign Inc.	VRSN
273	Verizon Communications Inc.	VZ
274	Waters Corp	WAT
275	Western Digital Corp	WDC
276	Wec Energy Group Inc.	WEC
277	Whirlpool Corp	WHR
278	Williams Cos Inc.	WMB
279	Weyerhaeuser Co	WY
280	Wynn Resorts Ltd	WYNN
281	United States Steel Corp	X
282	Xcel Energy Inc.	XEL
283	Exxon Mobil Corp	XOM
284	Dentsply Sirona Inc.	XRAY
285	Xerox Corp	XRX
286	Yum Brands Inc.	YUM
287	Zions Bancorporation	ZION